

## HIGH DENSITY OF BIRDS BREEDING IN A MODIFIED DECIDUOUS FOREST

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BREEDING bird populations in different mature upland deciduous forest communities commonly vary between 100 and 400 pairs per 100 acres (Kendeigh, 1961), although drastically altered habitats, such as those found in gardens and parks, might sustain as many as 1000 or even 1500 pairs per 100 acres (Pitelka, 1942; table 18.2 in Welty, 1963). For successful breeding in all these terrestrial habitats birds require sufficient food and feeding areas, nesting sites, singing perches, a general vegetational aspect, and perhaps other features. Changes in any of these biologic and physical features of the habitat will likely result in alteration of breeding success or population density or both. Turcek (1951), Oelke (1966), and others, for example, have noted that increased stratification of the vegetation in forests will generally result in higher breeding bird densities.

The present report considers a breeding bird population study at the University of Virginia Biological Station at Mountain Lake, Virginia between 19–29 June 1967. The Station, located atop Salt Pond Mountain at an elevation of 3800 feet, is surrounded by a second-growth oak-chestnut forest, although the chestnuts are now represented chiefly by sprouts due to blight. Dominant trees in the forest include white oak (*Quercus alba*), red oak (*Q. rubra*), cucumber tree (*Magnolia acuminata*), and black locust (*Robinia pseudo-acacia*). Mountain-laurel (*Kalmia latifolia*), blueberry (*Vaccinium corymbosum*), and flame azalea (*Azalea calendulacea*) are conspicuous shrubby plants. Beginning about 1930 the Station grounds have been partially cleared, and today present a park-like appearance (see photograph in Davis, 1959) because of the open lawns with their borders of preserved or planted mountain-laurel, *Rhododendron maximum*, blueberry, white (*Pinus strobus*) and pitch (*P. rigida*) pines, hemlock (*Tsuga canadensis*), and shrubby and herbaceous vegetation. An upperstory or canopy, although somewhat thinned out, consists of white, black, and red oaks, cucumber tree, and pines. The Station grounds differ, therefore, from the surrounding forests by having (1) open lawns, (2) an increase in the shrub layer, (3) thinned-out dominant trees, and (4) numerous (22) buildings that provided some additional nesting sites for Robins and Phoebes. One very small stream traverses a portion of the grounds. In a somewhat arbitrary fashion, we have divided the habitat into strata—ground layer, shrub layer, subcanopy, and canopy—a procedure similar to that of MacArthur and MacArthur (1961) in their use of “foliage height profiles.” Also, we have adopted the

stratal limits suggested by Elton and Miller (1954): ground layer, 0–½ ft; shrub layer, ½–6 ft; subcanopy, 6–15 ft; canopy, > 15 ft. The only difficulty with these limits in our study lies with the canopy which has a vertical range of 15–60 ft.

The breeding bird census was conducted by the author and 10 students on 10 acres that included most of the Station grounds described above. A territory-mapping technique was utilized: territorial limits of all birds on the area were accurately mapped as were occupied nests. Individuals or pairs whose territories were at the edge of and not within the 10-acre plot have been excluded from our totals. Furthermore, at least 7 additional species (potential breeders) were classified as visitors to the area because they were observed too infrequently to be considered as part of the current breeding population.

The results of our census at the Station (Table 1) showed 80 pairs (including some apparently unmated males) and 22 species on 10 acres (= 800 pairs per 100 acres). These figures differ markedly from those of Chandler (1960) for birds breeding in the deciduous forest neighboring the Station grounds. He found only 16 species and 190 pairs per 100 acres. Of the 22 species occupying territories on the Station grounds in 1967, 11 also bred in the contiguous second-growth hardwood forest and 6 in a forest-edge habitat. The three species with the highest breeding densities at the Station (Robin, Cedar Waxwing, Least Flycatcher), however, were absent in the nearby forests in 1967; neither were they represented in the hardwood forest communities studied by Chandler. The most abundant birds reported by Chandler were Ovenbird (*Seiurus aurocapillus*), Rose-breasted Grosbeak, and Red-eyed Vireo: of these three, only the Ovenbird had a higher breeding density in the nearby forests than on the Station grounds. At this elevation in the Virginia mountains and considering the generally continuous, unbroken stretches of deciduous forest, it is virtually axiomatic that forest-edge species, such as Indigo Bunting, Slate-colored Junco, Brown Thrasher, and Rufous-sided Towhee, would be restricted to and most abundant at the edge of small clearings or associated with roadside vegetation. The Station grounds obviously provided the edge-effects required by these species.

The high density of breeding birds at the Station appears to be attributable to two principal factors. First, as compared with vegetational aspects found in neighboring forests, artificial plantings of rhododendron and hemlock at the Station increased the shrub layer, thus increasing an edge-effect and more nesting sites for certain species. Second, and probably of greater significance than nesting site alone, is the fact that a partial clearing of the forest increased the distance between trees and introduced open spaces both horizontally and vertically, thereby effectively increasing feeding areas for

TABLE 1  
BREEDING BIRDS ON 10 ACRES OF MODIFIED DECIDUOUS FOREST  
AT MOUNTAIN LAKE, VIRGINIA IN JUNE 1967.

Species	Stratum <sup>1</sup> and mean nest height in feet	Number of occupied nests	Number of additional pairs	Number of additional territorial males	Totals
Robin ( <i>Turdus migratorius</i> )	C-SC; 23	14	2	1	17
Cedar Waxwing ( <i>Bombycilla cedrorum</i> )	C-SC; 28	10			10
Least Flycatcher ( <i>Empidonax minimus</i> )	C-SC; 28	7			7
Catbird ( <i>Dumetella carolinensis</i> )	SC-S; 9	6			6
Chipping Sparrow ( <i>Spizella passerina</i> )	C-SC; 31	4	1	1	6
Slate-colored Junco ( <i>Junco hyemalis</i> )	G	3	1	1	5
Rufous-sided Towhee ( <i>Pipilo erythrophthalmus</i> )	G	2	1		3
Rose-breasted Grosbeak ( <i>Phenicticus ludovicianus</i> )	C-SC; 36	3			3
Chestnut-sided Warbler ( <i>Dendroica pensylvanica</i> )	SC ; 8	2	1		3
Red-eyed Vireo ( <i>Vireo olivaceus</i> )	SC-C; 13	4			4
Scarlet Tanager ( <i>Piranga olivacea</i> )	C ; 40	2			2
Indigo Bunting ( <i>Passerina cyanea</i> )				2	2
Solitary Vireo ( <i>Vireo solitarius</i> )				2	2
Eastern Phoebe ( <i>Sayornis phoebe</i> )		2			2
White-breasted Nuthatch ( <i>Sitta carolinensis</i> )	C		1		1
Tufted Titmouse ( <i>Parus bicolor</i> )	C		1		1
Brown Thrasher ( <i>Toxostoma rufum</i> )	G	1			1
Wood Thrush ( <i>Hylocichla mustelina</i> )	C ; 20	1			1
Blackburnian Warbler ( <i>Dendroica fusca</i> )	C			1	1
Flicker ( <i>Colaptes auratus</i> )	C ; 40	1			1
Crested Flycatcher ( <i>Myiarchus crinitus</i> )	C		1		1
Wood Pewee ( <i>Contopus virens</i> )	C ; 40	1			1
Totals		63	9	8	80

<sup>1</sup> C—ground; S—shrub, SC—subcanopy, C—canopy;  
See text for limits of strata.

many species (Robins, flycatchers, ground-nesting species). The Station grounds, therefore, comprised a kind of forest and forest-edge "oasis" wherein vegetational strata, poorly represented, absent, or unmodified in the contiguous forests, could support an exceptionally high population of breeding birds.

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#### ANNOUNCEMENT

The 1970 Annual Meeting of the Western Bird Banding Association will be held at the Point Loma Inn, San Diego, California, on 24-26 April. Paper sessions and workshop discussions of new techniques and banding problems will be held on Saturday. On Sunday there will be several field trips including a boat trip to see pelagic species. For more complete information write to Dr. Charles T. Collins, Dept. of Biology, Calif. State College, Long Beach, Calif. 90801.